

**Description of  
DE19734913**

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The invention concerns a procedure for the production of sound absorbers, in particular for automotive technology, consisting of a carrier layer and at least an associated absorber layer after the generic term of the patent claim 1.

In automotive technology sound absorbers of the kind mentioned are used to the sound and lagging. The sound absorbers consist thereby of a plastic, a stealing, a sheet metal or an aluminum carrier and of an associated absorber part, which is responsible for the warming and sound absorption. These sound absorbers serve for example for the lining of the engine of a truck within the range between framework side members and driving cab lower surface, attached under the driving cab. The sound absorbers serve also for the lining of the engine compartment of passenger cars, which are to warm and sound-dam these both.

There is procedures for the production of such sound absorbers well-known, which manufacture first the self-supporting carrier part by means of a forming tool planned for it, afterwards the appropriate absorber layer by means of one for it planned forming tool manufactures and afterwards the carrier layer and the absorber layer, for example by sticking, interconnects.

The EP 0,229,977 B1 describes a noise-absorbing lining for the engine compartment of motor vehicles, which consists of a molded article of several situations, whereby these situations can be deformed by means of a procedure using pressure and warmth and under training by zones of compressions differently given in advance to the body. This lining consists of several situations,

 [top](#) which exhibit zones of different density with different pressure during their deformation, so that zones of practically nonporous compression as reinforcement ribs serve, which can a higher mechanical stability exhibit and thus to the sound absorber a certain self-supporting rigidity lend.

Of the GM 92 07 113,9 U1 it is well-known together form-pressed and firmly responsible with one another to make within a forming tool the absorber layer and the carrier layer. The connection of the carrier layer and the absorber layer takes place via injecting the carrier part and the absorber part within the same forming tool, whereby the use of several forming tools for the carrier layer and the absorber layer as well as a following connecting procedure is dispensable.

Of the DE 42 11 409 A1 it is well-known to make the carrier layer together with further absorptionswirksamen layers in a uniform press form procedure to a uniform form-stable workpiece. The Absorbtionsschicht is accordingly formally manufactured during a common warm press procedure with the carrier layer. In this manufacturing process first the lowest half of a form pressing tool with a prefabricated fleece is laid out, which serves as carrier layer, in order to close after applying the absorption layer the form pressing tool and to connect and press under thermal effect the individual layers formally. The sound absorber receives its final form, whereby the material of the carrier layer is additionally nonporously consolidated and injected to a self-supporting layer.

These aforementioned procedures use either a two step procedures or a so-called one and a half-step procedure for the production of the appropriate sound absorbers. Either will thereby first the carrier layer and the absorber layer separately manufactured, in order afterwards to be interconnected (2 steps), or it first the absorber prefabricated, is driven the tool, the appropriate material for the carrier layer (z. B. SMC) inserted and afterwards by a form press procedure formed with one another and positively connected (1 1/2 step).

The aforementioned procedures exhibit with the fact the disadvantage that the carrier layer can be not completely formed out. With the available prefabricated absorber layer only a limited quantity of absorption material is present for acoustic reasons and weight reasons. This is then no more with so high pressure loadable, in order to be able to pass the appropriate internal pressure on on the substrate, without the absorption material is too strongly consolidated and deformed thereby. By the fact the danger exists that the carrier layer and/or. the substrate on the side of the absorption layer not completely out-reacts and hardens. Higher press times increase the partial cycles very strongly, so that altogether higher production costs arise with not optimal acoustic characteristics.

Beyond that the conventional procedures exhibit the disadvantage that for exact forming out of the construction unit within the tool relatively much absorber substance must be inserted and as a result of it a higher weight arises, which in automotive technology in particular are unwanted. Also complex manufacturing methods are necessary, i.e., the use of high pressures and temperatures for the good connection of the carrier layer and the absorber layer, which likewise subjects the manufacturing methods additionally with higher costs.

The invention is the basis the task to improve a procedure for the production of sound absorbers

of the kind mentioned going by that appropriate sound absorbers are more economical and more simply producible, shorten the cycle times and the weight of such sound absorbers is reduced.

The invention is the basis likewise the task to indicate a procedure for the production of sound absorbers which leads to improved characteristics of the sound absorbers regarding the sound and thermal insulation and regarding the stability of the sound absorbers.

The invention solves the task mentioned by the characteristics of the requirement 1. Special execution forms of the invention are characterized in the Unteransprüchen.

In accordance with the invention a procedure for the production of sound absorbers is indicated, which consists of an intervening procedure. First the complete structure of material is inserted, i.e. both the material of the carrier layer and the material at least one absorber layer into the form pressing tool. Subsequently, all output layers are formally manufactured by thermal press figuration of a form pressing tool and interconnected positively. In particular carrier layer and at least one absorber layer are formed during the thermal Pressvorgangs according to the walls of the form pressing tool and hardened during the press figuration both and interconnected intimately. By the Ein-Schritt-Verfahren according to invention the prefabrication of a carrier layer is unnecessary, since this is formally manufactured at the same time during the form press procedure with the absorber layer.

Additionally from the absorber side compressed air is supplied according to invention during the press figuration. This compressed air is left cold at the beginning, in order to achieve a good forming out of the construction unit within the tool. By the following thing impressions of hot compressed air after the initial cold compressed air additionally the aged hardening time of the carrier layer and the absorber layer can be substantially decreased. A substantial Verkürzung of the cycle times results in the case of the production of the sound absorbers according to invention. In particular of SMC or when using glass fiber materials in connection with epoxy resin an intimate and very stable connection between the carrier layer and the absorber layer arises as a result of the supply of hot compressed air, whereby by the increased temperature the hardness and the stability of the epoxy resin, i.e. the carrier layer are improved.

The supplied compressed air is again exhausted by means of compressed air removals. By the use of valves for too and/or. Removal of compressed air can be regulated within the form pressing tool a purposeful pressing power. Depending upon used materials desired internal pressures can be in-regulated within the form press halves by an appropriate controlling of the valves and the initial pressure of the compressed air.

Blowing up leads to an accurate creation of the individual materials at the tool walls of the form pressing tool, which likewise contributes again to good heat transfer values and thus to the cycle time zykluszeitverkürzung.

Additionally to the carrier layer and the absorber layer a lower and an upper cover fleece layer can be brought in during the press figuration, which is formed out at the same time with the production of the carrier layer and the absorber layer. The cover fleece layers surround thereby the carrier layer and the appropriate absorber layers and form the ?outer skin? of the sound absorber. Between the carrier layer and the absorber layer additionally a foil can and/or. an atmospheric pressure layer to be brought in, which serves the carrier layer and the absorber layer for the better connection and which as diaphragm to the improvement of the acoustic characteristics contributes, if this is brought in between several absorber layers, which are connected with an appropriate carrier layer.

The same or even a better forming out degree can be attained by blowing up with substantially fewer absorber substances than this is possible with classical manufacturing methods with substantially more materials. Thus a substantial weight reduction of the construction units results in the case of same or even better characteristics, whereby in the acoustic range improved characteristics are attainable by additional diaphragm (foils) between the absorber layers.

By the Ein-Schritt-Verfahren according to invention no special connection technique is more between the carrier layer and the absorber layer necessary, although as a result of the uniform form press procedure a very stable and form-firm group arises, which the sound absorber makes self-stable.

Developing press steams during the form press procedure can be exhausted with the available invention purposefully, so that a pollution free filtering is made possible.

The compressed air is injected with a pressure by preferably 1-20 bar and heated up on temperatures, which correspond to the appropriate materials of the individual layers of the sound absorber. As material for the foil and/or. for the atmospheric pressure layer can be used PE, PP, PURE, TPU, PET or comparable materials. As material for the absorber layer going physician cotton or going physician Steinwolle is used.

Two special remark examples of the available invention are described on the basis the designs. Show:

Fig. 1 a cross section by a special execution form of the available invention;

Fig. 1a the cut A-A of the Fig. 1;

Fig. 2 a second execution form of the available invention; and

Fig. 2a the cut B-B of the Fig. 2.

Fig. 1 shows schematically the cut by a special execution form of the available invention.

Between the upper half of 1a of the form pressing tool and the lower half of 1b of the form pressing tool the individual layers of the sound absorber according to invention lie. Is a foil and/or an atmospheric pressure layer 5 between a carrier layer 4 and an absorber layer 3, which are surrounded by an upper cover fleece layer 2a and by a lower cover fleece layer 2b.

For the production of the sound absorber in the procedure according to invention first the lower cover fleece layer 2b is inserted into the lower half of 1b of the form pressing tool. On the lower cover fleece layer 2b the material for the carrier layer 4 is applied, which with a foil 5 one covers. On the foil 5 the material for the absorber layer 3 is applied and covered with the upper cover fleece layer 2a. Subsequently, the upper half 1a of the form pressing tool is driven and moved toward the lower half 1b of the form pressing tool. The upper half of 1a and the lower half of 1b of the form pressing tool are heated. While the two halves 1a and 1b of the form pressing tool are pressed against each other, both halves, 1a and 1b, are heated up.

By simultaneous admission of the individual layers of the sound absorber with pressure and heat the layers of the sound absorber are pressed within the form pressing tool to the walls of the upper half of 1a and the lower half of 1b of the form pressing tool. With the warmth and the pressure bevels itself the individual layers positively together and to the walls of the forming tool. At the same time the material of the carrier layer hardens 4 and adapts themselves the material of the absorber layer 3 according to the shaping of the form pressing tool to the lying close layers.

By additional admission of the interior of the form pressing tool with cold compressed air forming out the individual layers is supported within the form pressing tool, whereby by the further admission of the interior of the form pressing tool with hot compressed air the aged hardening time of the material of the carrier layer 4 is shortened, so that the entire manufacture procedure of the sound absorber becomes temporally shorter. The brought in compressed air serves also for the support of the heat transfer values and thus likewise for a reduction the cycle time of the production of the sound absorber.

Can fewer absorber substances be used by the admission with compressed air, in order to reach nevertheless an optimal forming out of the construction unit within the form pressing tool. Also the compressed air supports the intimate connection of the individual layers among themselves, so that on surplus epoxy resin and/or without additional connecting devices between the layers to be done can and/or so that fewer connecting devices to be used can. This leads to a substantial weight reduction of the entire sound absorber with simultaneous reaching of a high stability degree of the self-supporting and self-stable sound absorber.

Additional bringing in of the foil and/or serves the hermetic view 5 for the improvement of the connection between the absorber layer 3 and the carrier layer 4.

On the side of the absorber layer 3 of the form pressing tool, i.e. within the upper half of 1a of

the form pressing tool are compressed air supply 6, which can be attached to arbitrary places and which are intended in sufficient number, in order to supply the interior of the form pressing tool evenly with compressed air. The removal of the compressed air is done via appropriate compressed air removals 7, which favourable proves likewise within the upper form press half of 1a find. These compressed air removals 7 can be exhaust air holes, which open by valves, and/or to close leave, so that the duration and the height of the developed pressure within the form pressing tool steered and/or to be regulated can.

Fig. 1a shows the cut A-A after Fig. 1 with the upper half 1a of the form pressing tool of the upper cover fleece layer 2a, the absorber layer 3, the foil and/or the hermetic layer 5, the carrier layer 4, the lower cover fleece layer 2b and the lower half of 1b of the form pressing tool.

Fig. 2 shows the schematic cut by a further preferential execution form of the invention. This yields in relation to the execution form after Fig. 1, when here two absorber layers 3 are intended, those on a carrier layer 4 to be applied to that extent off and between which a foil and/or an atmospheric pressure layer 5 is brought in. The carrier layer 4 and the upper absorber layer surround 3 cover fleece layers 2a and 2b also here.

The procedure for the production of a sound absorber after Fig. 2 is identical to the procedure after Fig. 1, whereby here the foil and/or the atmospheric pressure layer 5 for the improvement of the acoustic characteristics of the sound absorber serves. By bringing in the foil and/or the hermetic layer 5 between the two absorber layers 3 results a diaphragm, which the two absorber layers 3 acoustically decoupled and thus improves the sound-absorbing characteristics of the sound absorber.

Fig. 2a shows the cut B-B by the second special execution form after the available invention with the upper half of 1a of the form pressing tool, the upper cover fleece layer 2a, the upper absorber layer 3, a foil and/or a hermetic layer 5, an absorber layer 3, a carrier layer 4, a lower cover fleece layer 2b and the lowest half of the form pressing tool 1b which is under it.

By the Ein-Schritt-Verfahren according to invention no special connection techniques are more necessary, so that several absorber layers 3 with intermediate foils and/or hermetic layers 5 are producible, so that self-stable and depending upon the desired requirements weight-reduced and sound absorbers producible with small cycle times result.

**Claims of DE19734913**

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1. Procedure for the production of sound absorbers, in particular for automotive technology, whereby carrier layer and at least one absorber layer are positively interconnected within a form pressing tool,  
thus characterized,  
that both the material of the carrier layer (4) and the material that are inserted at least absorber layer (3) into the form pressing tool (1a, 1b), and  
that by a thermal press figuration of the form pressing tool (1a, 1b) the carrier layer (4) and those are deformed at least one absorber layer (3) and interconnected positively.
2. Procedure according to requirement 1, by the fact characterized that during the press figuration compressed air is inserted by compressed air supply (6) into the form pressing tool (1a, 1b).
3. Procedure according to requirement 1 or 2 to form out marked by it that during the press figuration cold compressed air is inserted by compressed air supply (6) into the form pressing tool (1a, 1b), in order the carrier layer (4) and those at least one absorber layer (3) according to the walls of the form pressing tool (1a, 1b) properly matching and that hot compressed air is inserted by compressed air supply (6) into the form pressing tool (1a, 1b), in order the carrier layer (4) and those at least one absorber layer (3) to out-harden and positively interconnect.
4. Procedure after one of the preceding requirements, by the fact characterized that during the press figuration compressed air is exhausted by compressed air removals (7) from the form pressing tool (1a, 1b).▲ top
5. Procedure after one of the preceding requirements, by the fact characterized that during the press figuration compressed air by compressed air supply (6) and compressed air removals (7) into that and/or. from the form pressing tool (1a, 1b) in-/and/or. is exhausted, whereby the

compressed air supply (6) and/or the compressed air removals (7) are controllable by valves, so that a desired pressing power is in-regulated.

6. Procedures after one of the preceding requirements, by it marked additionally that except the carrier layer (4) and that at least absorber layer (3) a lower and an upper cover fleece layer (2a, 2b) are formed out during the press figuration, the carrier layer (4) and those at least one absorber layer (3) surround.

7. Procedure after one of the preceding requirements, by the fact characterized that between the carrier layer (4) and that at least absorber layer (3) a foil and/or. an atmospheric pressure layer (5) is brought in.

8. Procedure after one of the preceding requirements, by the fact characterized that several absorber layers (3) are formed out during the press figuration, whereby foils and/or. atmospheric pressure layers (5) between the absorber layers to be brought in.

9. Procedure after one of the preceding requirements, by the fact characterized that compressed air with a pressure is used by 1-20 bar.

10. Procedure after one of the preceding requirements, by the fact characterized that as material for the carrier layer (4) SMC and/or glass fiber with epoxy resin is used.

11. Procedure after one of the preceding requirements, by the fact characterized that as material for the foil and/or. for the atmospheric pressure layer (5) is used PE, PP, PURE, TPU and/or PET.

12. Procedure after one of the preceding requirements, by the fact characterized that as material for the absorber layer (3) going physician cotton and/or going physician Steinwolle are used.